REGIONAL BIODIVERSITY MANAGEMENT STRATEGY: CASE STUDY ON THE FLINDERS RANGES

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PREFACE

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis, when deposited in the University Library, being available for loan and photocopying, provided that acknowledgment is made of any reference to work therein.

Signed ..... Date 24 March, 2000

ABSTRACT

This thesis examines the rationale for managing biological diversity on a regional basis and develops recommendations for the use of two computational methods in regional biodiversity management planning by conducting a case study in the Flinders Ranges, centred on the Yellow-footed Rock Wallaby *Petrogale xanthopus*.

The research was conducted by a combination of literature review on the importance and practices of managing biodiversity on a regional basis, bioclimatic analysis on the distribution of *P. xanthopus* in South Australia, using bioclimatic prediction system (BIOCLIM), and an application of Population Viability Analysis (PVA) for the long-term management strategy of *P. xanthopus*, using computer simulation package ALEX.

BIOCLIM

The primary objective of this analysis was to identify priority area in the bioregion by predicting the distribution of *P. xanthopus*.

Three types of distribution (extant, extinct and all-time) were predicted using BIOCLIM. These analyses suggest that climate determines the general distributional pattern of *P. xanthopus* in South Australia.

As a controversy, the actual distributional pattern will not always coincide with the predicted ones. This situation is probably caused by the factors other than climatic variables. The other factors may include such hypotheses as predation by exotic carnivores and Wedge-tailed Eagle and competition with again exotic species as goat. This hypothesis is supported by the prediction of possible extinct distribution. The bioclimatic signatures of the predicted and actual regions were identical. If the climate was a factor that forces the species extinction we must have a completely different result. However, our result suggests that the climatic variables are not the

major determinant of the Yellow-footed Rock Wallaby extinction in South Australia.

BIOCLIM does not predict the distribution of the species, rather it predicts the area climatically suitable for a particular species distribution. If, the climatically suitable area supports preferred habitats of *P. xanthopus* with shelter sites, then it could be considered as an area to have a high probability of finding additional populations of the species or more realistically specimens.

PVA:

The main objective of this analysis was to minimise the chance of extinction of *P. xanthopus*.

In this part of the thesis, the hypothesis that arised by BIOCLIM analysis is tested. The predation by exotic carnivores and competition with introduced herbivores are considered to be the major threats to *P. xanthopus* decline in South Australia.

The result of the analysis demonstrated that there is a high probability of extinction amongst populations of *P. xanthopus* in a set of small patches of <60 ha. Similarly, single patch of <360 ha does not have significant effect on the species persistence.

Set of 5 or more patches, each of >100 ha in size, located within 10-15 km from each other was that most likely to support *P. xanthopus* populations and these areas make the greatest contribution to the persistence of the species in the Flinders Ranges.

Increase of mortality rates of all ages reduced the median time to extinction drastically. The highest probability of extinction occurs with an increase in the mortality rate of adult wallaby. The results of the analyses suggest that reducing the mortality rate of adult female wallabies would be a highly successful option for the conservation of *P. xanthopus* colonies.

Conclusion

Cooperative efforts of identifying priority areas for the biodiversity management and setting priorities for the actions in the area are the crucial responses for the development of biodiversity management strategy in a particular area. For this task BIOCLIM and PVA appeared to be powerful tools if the target species has been chosen correctly. However, the selection of 'right' species is a very demanding task. Therefore, for the development of such strategy, it might be wise to select several species with different backgrounds of life-history and distributions.